Commonwealth of Kentucky
Division for Air Quality

PERMIT STATEMENT OF BASIS

TITLE V (PROPOSED) NO. V-05-067
CARBIDE INDUSTRIES, LLC
CALVERT CITY, KY
MARCH 30, 2007
REVIEWED BY VAHID BAKHTIAR

SOURCE I.D. #:	021-157-00025
SOURCE A.I. #:	2928
ACTIVITY #:	APE20040001

SOURCE DESCRIPTION:
Carbide Industries, LLC located in Calvert City, Kentucky operates primarily an Industrial Inorganic Chemical – calcium carbide production facility. Acetylene is also produced at the facility as well as desulfurization reagents, calcium hydroxide, calcined anthracite coal, and electrode paste. The products are sold to a wide range of industries from acetylene producers, chemical manufacturers, steel foundries to aluminum producers.

The Calvert City facility produces calcium carbide from coke and lime in a 35 MW semi-sealed 3-phase submerged electric arc furnace. The calcium carbide is crushed and sized per costumer specifications. Desulfurization reagents are produced by grinding calcium carbide in a ball mill to produce a very fine particle size and may be blended with various additives. Acetylene is also produced by the introduction of calcium carbide into water. The acetylene is then piped to the customer. The byproduct of the acetylene production, calcium hydroxide, is also shipped or piped to the customer. Electrode paste is produced by combining calcined coal and coal tar pitch. The pitch is heated to a semi-fluid state while mixing by a 2.009 mmBtu/hr natural gas process steam boiler. All raw materials are received and solid products are shipped via railcar or truck.

Moisture in the coke and lime charged to the furnace create potentially hazardous operating conditions and reduces operating efficiency. The coke is pre-dried in a natural gas or carbon monoxide fired dryer and both the coke and lime are conveyed under enclosed material handling equipment to keep the charge mix dry. The coke dryer, when available, is fueled with scrubbed CO off-gas from the arc furnace.

For regulatory purposes, the Calvert City facility is divided into four process areas: PA-1) Furnace Department – Calcium Carbide Manufacturing; PA-2) Calcine and Paste Department; PA-3) Pack/Environmentally Clean Desulfurization (ECD)/Desulfurization Department; and PA-4) Acetylene Department. Each process area is subdivided into sub-processes: the furnace department is divided into the lime handling, coke handling and furnace charge handling systems, and furnace operations; the calcine and paste department is divided into coal calcining and paste production operations; the pack department is divided into the packing system and the ECD and desulfurization systems; the acetylene department includes acetylene process and hydrate handling processes.

Carbide Industries, LLC Calvert City facility is considered a major source due to potential emissions of CO and VOC greater than one hundred (100) tons per year each. Carbide Industries, LLC Calvert City facility has applied for the initial Title V operating permit, with the application received at the Division on June 9, 2000. The Division recognizes the application complete date of August 8, 2000, 60 days following the receipt of the permit application.

The only revision to the facilities permit conditions requested by the June 2000 application is the increase in submerged electric arc furnace power load from 29 Megawatts to 35 Megawatts. Potential emissions and permit limitations reflect this change.

The facility is required to install continuous opacity monitors and continuous power input and flow rate monitors on the submerged electric arc furnace and associated control devices as specified in 40 CFR 60 Subpart Z. Therefore Carbide Industries will be required to develop a CAM Plan for submittal in conjunction with the permit renewal application at least 6 months before this permit expires.

COMMENTS:

Type of control and efficiency

Wet Scrubbers

The gas stream from the submerged electric arc furnace is vented though wet venturi scrubber to remove particulate matter. The scrubbed stream is sent either to EP PA-1 (07) coke dryer as process fuel or to EP PA-1 (55) flare for control of carbon monoxide (CO). The control efficiency of the scrubbers are not considered in potential emission calculations, the flare and baghouse system efficiencies used in calculations are listed below.

Flares

The Furnace Flare is used to control CO emissions from EP PA-1 (55) submerged electric arc furnace at 99.9 percent efficiency. During operation of EP PA-1 (07) coke dryer, the scrubbed furnace gas stream is vented to the coke dryer as process fuel.

Flares associated with EP PA-2 (98 - 103) Calcine Furnaces #3 - #8 are used to control 95% anthracite coal volatiles, 95% CO, and 76% particulate matter.

Dust Collectors/Baghouses

The arc furnace is equipped with an eight baghouse system which controls particulate from tapping and furnace operations that is collected by the furnace hood and directed to the baghaouse system. Emission points PA-1 (40) through PA-1 (43) control the particulate emissions from the furnace and tapping hood with a 99.6 percent efficiency.

The coke dryer is equipped with a dust collector that controls particulate with 99.0 percent efficiency.

Several other dust collector units are associated with insignificant activities including EP (77) through (79), (112), (54), and (140). Each unit is designed to control particulate with greater than 99 percent efficiency.

Emission factors and their source

Emission factors were derived from a variety of sources. AP-42 emission factors were utilized for the combustion of natural gas derived from Chapter 1.4 and emissions from calcium carbide manufacturing (furnace, tapping, flare, charging and cooling conveyors) were derived from Chapter 11.4. Particulate and SO2 emission factors for the coke dryer and arc furnace dust collectors were derived from stack testing from June 1982 and 1985. Speciated VOC/HAP from the consumption of electrode paste were derived from the Speciate® computer application. All other emission factors were taken from the 2005 KY EIS or derived from engineering estimates.

Applicable regulation
This source is subject to:

1. 401 KAR 59:105, New process gas streams.

2. 401 KAR 59:015, New indirect heat exchangers, applies to heat exchangers with a capacity of 250 mmBtu/hr or less that were constructed on or after April 9, 1972.

3. 401 KAR 59:010, New process operations, applies to particulate matter emissions.

4. 401 KAR 61:020, Existing process operations, applies to particulate matter emissions.

5. 401 KAR 60:005 Section 3(1)(gg), incorporating by reference 40 CFR 60 Subpart Z, applies to the emission of particulate and carbon monoxide.

6. 401 KAR 63:015, Flares

7. 401 KAR 63:010, Fugitive emissions

The following is a list of significant sources:
The significant sources are grouped by process areas (PA).

PA-1 (07) Coke Dryer, consists of a 22 mmBtu/hr dryer that has a maximum processing rate of 73,000 tons coke /yr. The dryer is fired on either CO off-gas from the arc furnace or natural gas. Particulate emissions are controlled by dust collector/baghouse system.

PA-1 (*) Submerged Electric Arc Furnace, a 35 MW 3- phase submerged electric arc furnace, semi-sealed. Off-gas is vented to a Kinpactor scrubber followed by cyclonic separator to a compressor to the coke dryer or flare. Particulate emissions from the furnace are controlled by an 8-baghouse system.

* EP 36 Furnace Tapping Hood
EP 37 Furnace Hood
EP 40 Furnace Dust Collector SW Fan
EP 41 Furnace Dust Collector SE Fan
EP 42 Furnace Dust Collector NW Fan
EP 43 Furnace Dust Collector NE Fan
EP 55 Furnace Flare Stack

PA-2 (**) Existing Calcine Furnaces, consists of five electric calcine furnaces with a maximum processing rate of 1.08 tons anthracite coal per hour each. Each furnace is equipped

with an individual manually lit flare for control of anthracite coal volatile off gases. The flares are fueled on natural gas.

**	EP 98	#3 Calcine Furnace Flare Stack
	EP 99	#4 Calcine Furnace Flare Stack
	EP 100	#5 Calcine Furnace Flare Stack
	EP 101	#6 Calcine Furnace Flare Stack
	EP 102	#7 Calcine Furnace Flare Stack

PA-2 (103) New Calcine Furnace, one electric calcine furnace with a maximum processing rate of 1.38 tons anthracite coal per hour. The furnace is equipped with an individual manually lit flare for control of anthracite coal volatile off gases. The flare is fueled on natural gas.

PA-2 (140) Paste Plant Ball Mill, consists of a calcined coal ball mill with a continuous rating of 1.6 tons calcined coal per hour. Particulate matter is controlled by a dust collector/baghouse.

EP 02 (104) Process Steam Generator, consists of one Fulton 2.009 mmBtu/hr natural gas fired steam generator.

PA-4 (***) Acetylene Operations, significant sources of acetylene (a VOC) include wet slurry sump and wet slurry vat. Particulate emissions from acetylene generation system are controlled by two baghouses.

***	EP 126	Wet Slurry Sump
	EP 127	Wet Slurry Vat
	EP 142	Acetylene Generation System Baghouse #1
	EP 143	Acetylene Generation System Baghouse #2

Applicable requirements specific to each emission unit are listed as follows:

EP 02 (104), Process Steam Generators

401 KAR 59:015, *New Indirect Heat Exchangers Constructed On or After April 9, 1972* applies to particulate, sulfur dioxide, and visible emissions. Compliance assurance with particulate is met by combusting only fuels listed in the permit. Compliance assurance with sulfur dioxide limits may be demonstrated by fuel sampling and testing by the permittee or certification by the supplier. Compliance assurance with opacity is met by burning natural gas. If visible emissions are observed, the permittee shall perform Reference Method 9 opacity testing.

The following sources are subject to 401 KAR 59:010

PA-1 (07) Coke Dryer
PA-2 (103) New Calcine Furnace
PA-2 (140) Paste Plant Ball Mill

401 KAR 59:010, *New Process Operations* applies to the aforementioned emission units that have the potential for visible emissions and to emit particulate matter. PM emissions are limited in accordance with 401 KAR 59:010 Section 3(2), and visible

emissions limited to less than 20% opacity. All units are equipped with control equipment including fabric filters, dust collectors, and baghouses depending on the unit. Compliance assurance with particulate emissions is met by monitoring process weight, hours of operation, and emissions calculations as applicable. The facility shall perform weekly operating observations on the control equipment, or when an emission unit is only periodically in operation, the observations shall be performed when the equipment is operating. For compliance assurance with opacity limits, the permittee shall perform biweekly qualitative visual opacity observations. If visible emissions are observed, the permittee shall perform Reference Method 9 opacity testing.

The following sources are subject to 401 KAR 61:020

PA-2 (**) Existing Calcine Furnaces (and associated emission points)
PA-4 (***) Acetylene Operations

401 KAR 61:020, *Existing Process Operations* applies to the aforementioned emission units that have the potential for visible emissions and to emit particulate matter. PM emissions are limited in accordance with 401 KAR 61:020 Section 3(2), and visible emissions limited to less than 40% opacity. All units are equipped with control equipment including fabric filters, dust collectors, and baghouses depending on the unit. Compliance assurance with particulate emissions is met by monitoring process weight, hours of operation, and emissions calculations as applicable. The facility shall perform weekly operating observations on the control equipment, or when an emission unit is only periodically in operation, the observations shall be performed when the equipment is operating. For compliance assurance with opacity limits, the permittee shall perform biweekly qualitative visual opacity observations. If visible emissions are observed, the permittee shall perform Reference Method 9 opacity testing.

The following sources are subject to 401 KAR 63:015

PA-1(*) Submerged Electric Arc Furnace (and associated emission points)
PA-2 (**) Existing Calcine Furnaces (and associated emission points)
PA-2 (103) New Calcine Furnace

401 KAR 63:015, *Flares* applies to the aforementioned emission units that have the potential for visible emissions. For compliance assurance with opacity limits, the permittee shall perform biweekly qualitative visual opacity observations. If visible emissions are observed, the permittee shall perform Reference Method 9 opacity testing.

The following sources are subject to 401 KAR 63:010

PA-4 (***) Acetylene Operations (and associated emission points)

401 KAR 63:010, *Fugitive emission* applies to the aforementioned emission units that have the potential to release fugitive particulate emissions from any process operation. The facility shall take precaution to not allow any particulate matter to become airborne and discharge beyond the line of the property.

The following source is subject to 40 CFR 60 Subpart Z

PA-1(*) Submerged Electric Arc Furnace (and associated emission points)

401 KAR 60:005 Section 3(1)(gg), incorporating by reference 40 CFR 60 Subpart Z, *Standards of Performance for Ferroalloy Production Facilities* applies to the emission of particulate matter, visual opacity, and carbon monoxide. PM emissions are limited in accordance with 40 CFR 60 Subpart Z while producing calcium carbide. Visible emissions are limited to less than 15% opacity from any control device, less than 40% during a tapping period while flow rates are being established under §60.265(d), and less than 10% opacity from any dust-handling equipment. Flaring or combustion of the CO as fuel in the coke drying process constitutes compliance with CO standards. The submerged arc furnace is equipped with control equipment including Venturi scrubbers, and dust collectors/baghouses, and a flare. Compliance assurance with particulate emissions is met by monitoring process weight, hours of operation, performance testing, and emissions calculations as applicable. The facility shall perform weekly operating observations on the control equipment, or when an emission unit is only periodically in operation, the observations shall be performed when the equipment is operating. For compliance assurance with opacity limits, the permittee shall perform biweekly qualitative visual opacity observations. If visible emissions are observed, the permittee shall perform Reference Method 9 opacity testing. Continuous opacity monitors, continuous flow rate monitors, and continuous power input monitors shall also be installed, calibrated, and maintained on each control device.

The following source is subject to 401 KAR 59:105

PA-1(*) Submerged Electric Arc Furnace (and associated emission points)

401 KAR 59:105, *New process gas streams* applies to the emission of sulfur dioxide SO2. Compliance with the SO2 standard is demonstrated by performance testing using Reference Method 6.

Non-Applicable Regulations:

401 KAR 60:005, Section 3(1)(e), *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units* [40 CFR 60 Subpart Dc] applies to Steam generating units with capacities between 10 and 100 mmBtu/hr constructed after June 9, 1989. The existing boilers were constructed prior to 1989.

40 CFR 63 Subpart DDDDD – *National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters* applies to an industrial, commercial, or institutional boiler or process heater as defined in §63.7575 that is located at, or is

part of, a major source of HAP. Carbide Industries Calvert City facility is not a major source of HAP.

EMISSION AND OPERATING CAPS DESCRIPTION:

None

PERIODIC MONITORING:

PM/PM10

The permittee shall monitor the monthly (calendar month) fuel usage rate (cubic feet per month or gallons per month) of the natural gas and the monthly hours of operation of the boiler.

Opacity

The permittee shall perform Reference Method 9 on each stack or vent if requested by the Division, and qualitative visual observations of the opacity from each stack or vent biweekly. If visible emissions are observed during the observations, the permittee shall perform opacity readings using Reference Method 9.

SO2

The permittee shall monitor the monthly fuel usage rate of the natural gas and the monthly hours of operation of the boiler.

Control Equipment

The facility shall perform weekly operating observations on the control equipment, or when an emission unit is only periodically in operation, the observations shall be performed when the equipment is operating.

OPERATIONAL FLEXIBILITY:

None

CREDIBLE EVIDENCE:

This permit contains provisions which require that specific test methods, monitoring or recordkeeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has only adopted the provisions of 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12 into its air quality regulations.